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A case of epithelioma of the scrotum occurring in a tarworker.

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The subject of chronic carcinoma occurring in tarworkers has received very careful attention from Mr. Butlin, who has detailed all that was known about it in the third lecture which he delivered in 1892 as Professor of Pathology at the Royal College of Surgeons of England. The bibliography of the subject is fully given in the printed lecture ('British Medical Journal,' vol. ii, 1892, p. 68). The disease, however, is a rare one, and appears to be getting rarer as masters and workmen recognise more fully the irritating properties of gas tar and take increasing pains to lessen its evil effects upon the skin. It therefore appears worth while to record the present case, especially as I cannot ascertain that any instance of tarworkers' cancer has hitherto been brought under the notice of this Society.

I am indebted to Mr. Butlin for permission to make a minute examination of the cancer. I was anxious to find out whether any effect would follow its inoculation upon an irritated mucous membrane, so he kindly permitted me to have the ulcerated mass immediately after its removal from the body.

The history of the case is shortly as follows: W. N—, aged 47, a barge-builder, was admitted into St. Bartholomew's Hospital on May 3rd, 1893, under the care of Mr. Butlin, for the removal of a typical epitheliomatous ulcer situated upon the lower and front part of the scrotum. The ulcer began as a small dry sore in November, 1892, and at the time of his admission to the hospital there was a slight enlargement of one lymphatic gland in his left groin. The patient states that in the course of his occupation of building barges he often uses boiling tar, and that his clothes are frequently soaked through with it. The pitch is always obtained from the gasworks, and he has never used wood-tar. There are no warts on his skin, though there are several on the unaffected part of his scrotum. He takes a bath about once a fortnight. He does

not know whether any of his fellow-workmen are affected in a similar manner.

A piece of the cancerous growth removed at 12.30 on May 6th was introduced at 2 o'clock into the irritated vaginæ of a white rat and of a rabbit. The vagina of the rat had been kept sore by the daily application of liniment of iodine from April 17th to May 6th, 1893, whilst that of the rabbit had been irritated by similar means from September 22nd, 1892, until May 6th, 1893. Each piece of tissue was kept in the vagina by a suture passed through the vulva. The sutures held for four days, but beyond a slight purulent vaginitis in the rabbit, which lasted for two days, there was absolutely no result from the inoculation in either animal. This negative result was the more disappointing because I had hoped to prove one of the conclusions arrived at by Mr. Butlin in his lectures that "it may be possible to prepare the skin for the occurrence of cancer by the constant or repeated application to it of certain substances for long periods." I thought that perhaps it might be possible by irritating mucous surfaces to prepare the soil, speaking figuratively, in such a manner that when cancerous tissues were brought into contact with it the seed would grow. In this case irritation appeared to be a factor in the causation of the epithelioma, and it therefore seemed to be a specially favourable one for trying the truth of the hypothesis.

The general histological appearances of tar cancer were excellently described by Dr. Karl Schuchard in Volkmann's 'Sammlung klinischer Vorträge-Chirurgie,' No. 257, for 1885, pp. 2223—2227. Recent methods, however, have enabled us to observe more closely the minute structure of the cancerous mass, and to make the description more interesting some of the appearances seen in the sections are here represented by photographs made directly from the preparations magnified from 100 to 1000 times. The sections were made by the Neapolitan method after the absolutely fresh tissue had been hardened for twenty-four hours in a solution of Müller's fluid saturated with corrosive sublimate. They were stained either with Ehrlich's hæmatoxylin, Biondi's reagent, or eosin and aniline blue.

(1) The stratum corneum is normal in the part which has *not yet ulcerated*, the papillæ are not materially thickened, nor are they more complex than usual. The prickle cells, however, are very numerous the individual processes being extremely well defined;

whilst the columnar cells in the deepest layer of the stratum Malpighii contain an unusual number of pigment granules. The corium in the neighbourhood of the ulcerated part is infiltrated with round cells, the hair-follicles are normal, and here and there minute hairs can be seen in section. The sebaceous glands are large, healthy, and distinct. The sweat-glands are large, as is usual in the scrotum, but the lumen often contains a granular *débris* lying just internal to the cells, and apparently derived from them by a process of horny degeneration.

The papillæ, as the ulcerated part is reached, are increased in length, breadth, and complexity by the downgrowth of epithelial processes. These processes are derived from the stratum Malpighii, for the stratum corneum remains unaltered, whilst the more superficial cells of the rete mucosum are vacuolated in the manner characteristic of chronic epithelial irritation. The ingrowths of epithelium in their simplest form are flask-shaped, the neck consisting of two layers of columnar cells separated by cells of the more superficial layer of the rete mucosum. The bulbous end of the flask often contains one or more large cells, and similar cells are frequently seen lying in the neck of the flask between the two layers of columnar cells. The horny changes in the cells are particularly well marked, and it is easy to trace the various stages from the single large central cell to those degenerate epithelial masses consisting of many concentric layers of horny tissue to which in this country we generally apply the term "cell-nest" or "pearl."

The large cells in the flask-shaped extremity of the epithelial ingrowths are deserving of a more careful study than they have hitherto received, for they appear to afford an explanation of the method by which one variety of these epithelial pearls are produced. These large cells seem to be derived from the superficial layer of the rete, a few being carried downwards by the ingrowth from this layer, the cells so carried down undergoing a horny change. Some of these cells can be seen in longitudinal sections of the epithelial ingrowths, and others in transverse sections of similar ingrowths. In some cases the transverse sections of an epithelial ingrowth show that there are two cells (Fig.), one of which appears to be in the act of fusing with the other; whilst in other parts of the section there are also two cells, but one is undergoing horny change, and the other undergoing some form of

degeneration. In these sections the cells of the surrounding epithelial ingrowth are visible as a single layer of cubical prickle-cells. In each of the large cells (as in that represented in Fig.)



Prickle-cells in process of fusion.—The deeply staining cell on the right is separated from its limiting membrane and from its neighbour by a radially striated and transparent zone. Outside the limiting membrane, and separating it from the surrounding epithelial cells, which are not shown in this semi-diagrammatic drawing, is a radially striated outer zone.

there is a well-defined limiting membrane, which appears to be in process of horny change. The cell substance, which stains deeply, does not fill up the entire cell, for it is separated from the limiting membrane by a transparent zone which is radially striated ; outside the limiting membrane, and separating it from the surrounding epithelial cells [not shown in the figure], is a second transparent zone, which is also radially striated. I assume that further degenerative changes take place in the cell—changes which begin in the cell substance immediately round the nucleus and result in the formation of horny material. The cells in this way become the centres of one variety of epithelial pearls, though such pearls may be produced in many other ways.

There appears to be no doubt that the cells with double radial striation which I have here described are identical with those drawn by Dr. Ludwig Pfeiffer in his ' Protozoen als Krankheitserreger,' Jena, 1891, p. 206, and reproduced in his work on ' Zell Erkrankungen,' figs. 53 *a*, *b*, p. 101, published in 1893. These forms he describes, upon insufficient evidence, as the resting stage of parasites ; they were found in a carcinoma of the penis. My

specimens undoubtedly show that the appearances he believes to be parasitic are in reality the results of cell fusion, and that it is unnecessary to assume them to be in any way associated with the life history of a protozoon.

Similar but not identical cells have been described as occurring in cancer by Dr. Steinhaus in 'Virchow's Archiv,' vol. 175, pl. iv, figs. 11 and 13. He correctly describes them as forms of cell inclusion, though it would appear that "cell fusion," as Dr. Kanthack suggests, would be the more correct term to employ.

Dr. Joseph Claessen, of Giessen, has also drawn attention to an analogous form of radially striated cell. His description with a drawing will be found in 'Ziegler's Beiträge,' xiv (1893), p. 9, and pl. i, fig. 14.

(2) The processes of epithelium are so fused in *the ulcerated* portion of the growth that it is impossible to distinguish one from another. They extend deeply into the corium, and in their most minute ramifications the limiting membrane which separates the epithelium from the subjacent connective tissue is often wanting, so that the individual epithelial cells are found lying among the connective-tissue elements of the true skin. Many of the cells of the upper layers of the stratum mucosum have undergone a horny change, whilst cell nests or pearls are very numerous, and their conversion into concentric masses of keratin is in many cases very complete, though in others cell-degeneration, or perhaps cell-secretion, has left the cell-nest in a more diffuse condition. The pearls are distributed throughout the epithelial ingrowth, some being situated so close to the surface as to be cast off with the ulcerated fragments, whilst others are found in the depths of the cancerous mass.

The sections of the new growth have been examined very carefully for "cancer bodies;" there are none in the centre of the growth. A few small structures are visible at the periphery, but they are so indistinct and the surrounding cells are so degenerate that I hesitate to affirm their presence, though there is but little doubt that they are present in this particular instance, and that they will be found in other specimens of this variety of epithelioma which may be examined with sufficient care.

January 2nd, 1894.

Report of the Morbid Growths Committee on Mr. D'Arcy Power's specimen of tar cancer.—We do not find it necessary to add anything to the author's description.

The author describes, amongst other appearances, invagination of prickle-cells, which he regards as of the same nature as certain forms of what are described by L. Pfeiffer as parasites. With this opinion we agree.

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